

WE CLAIM:

1. A circulation system for drawing water from the depths of a body of water to the surface for exposure to the atmosphere and creating a circulation pattern in the body of water, said system including a flotation platform, a dish supported slightly below said surface, an impeller, and a draft tube depending from an annular housing wherein the bottom of the dish is spaced from the top of the housing to create an annular opening extending substantially about a vertical axis and wherein a first portion of the water uplifted through the draft tube by the impeller passes out of the annular opening and a second portion of the uplifted water passes up through and out over the top of the dish.

2. The system of claim 1 wherein the ratio of the first and second portions is about 2:1 so that about 2/3rds of the uplifted water passes out the annular opening and about 1/3rd passes out over the top of the dish.

3. The system of claim 1 wherein the ratio of the first and second portions is about 3:1 to 1:1.

4. The system of claim 1 wherein the impeller has a plurality of blades with diameters less than the diameter of the annular housing wherein an annular gap is created between the blades and the housing.

5. The system of claim 4 wherein the blade diameters are less than the diameter of the draft tube.

6. The system of claim 1 wherein the draft tube is constructed to be substantially neutrally buoyant.

7. A water circulation system for drawing water from the depths of a body of water to the surface for exposure to the atmosphere and creating a circulation pattern in the body of water, said system including a flotation platform, a dish supported slightly below said surface, an impeller, and a draft tube having upper and lower end portions wherein the draft tube is collapsible and the length thereof adjustable to vary the depth of the lower end portion of the draft tube in the water

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10 8. The system of claim 7 wherein the length of the draft tube is adjustable by a cable arrangement attached between the flotation platform and the lower end portion of the draft tube.

9. The system of claim 8 wherein the cable arrangement includes a cable passing from the flotation platform through a support and down to the lower end portion of the draft tube, said support including a vertical vane extending across the flow of uplifted water adjacent the upper end portion of said draft tube.

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10. The system of claim 9 wherein the upper end portion of the draft tube is secured to an annular housing and the vertical vane extends across the interior of said housing.

11. The system of claim 8 wherein the cable arrangement includes a spring to absorb the force of surface waves raising the flotation platform.

12. The system of claim 11 wherein the cable arrangement further includes a cable section to limit the expansion of the spring.

13. The system of claim 11 wherein the cable arrangement further includes a cable section to prevent the expansion of the collapsible draft tube beyond a predetermined limit.

14. The system of claim 7 wherein the collapsible draft tube is constructed to be substantially neutrally buoyant.

15. The system of claim 7 wherein the walls of the draft tube have a substantially accordion shape.

16. A water circulation system for ponds, lakes, and other bodies of water, said system including a flotation platform, dish, impeller, and draft tube having upper and lower end portions, said draft tube extending downwardly into the body of water wherein water is lifted by the impeller from adjacent the lower end portion of the draft tube to flow up through the draft tube toward the dish and wherein said system further includes a generator positioned in the uplifted flow to impart energy thereto.

17. The system of claim 16 wherein the generator is positioned in the uplifted flow below the impeller.

18. The system of claim 16 wherein the generator is positioned in the uplifted flow adjacent the upper end portion of the draft tube.

19. The system of claim 16 wherein the generator imparts a magnetic field to the uplifted flow.

20. The system of claim 16 wherein the generator imparts an electric current to the uplifted flow.

21. The system of claim 16 wherein the generator imparts sonic waves to the uplifted flow.

22. The system of claim 16 wherein the generator imparts ultrasonic waves to the uplifted flow.

23. The system of claim 16 wherein the generator is solar powered.

24. The system of claim 16 wherein calcium and phosphate molecules are present in the water and the generator serves to create apatite therefrom.

25. A circulation system for a body of water having a surface and a bottom and further having an upper zone extending downwardly from the surface and a lower zone extending upwardly from the bottom toward the upper zone wherein a circulating flow is established and substantially limited to the upper zone leaving the lower zone substantially isolated therefrom while bringing up a relatively small volume of the contents of the lower zone into the upper zone for circulation therein with the existing contents of the upper zone, said system including:
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a flotation platform, a dish substantially supported adjacent the surface of the body of water, an impeller, a housing adjacent said impeller, a draft tube, and a draft tube supporting arrangement,
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20 said supporting arrangement including a plate member extending substantially horizontally about and outwardly of a substantially vertical axis and being vertically spaced from and below said impeller and
25 said housing, said plate member and said housing creating an inlet opening therebetween to said impeller, said inlet opening extending substantially about said vertical axis, said draft tube having a main body, an inlet portion, and an outlet portion,
30 said main body extending downwardly from said plate member to position the inlet portion thereof adjacent the lower zone of said body of water, said plate member having an opening therethrough and said outlet portion of said draft tube extending through said opening up to a position above said plate member adjacent said impeller wherein said impeller draws a first volume of water substantially horizontally above said plate member with a portion thereof passing through the inlet opening between
35 the plate member and the housing to the impeller and toward the surface of the body of water and the remaining portion of said first volume being induced by the movement of the first portion to flow toward the surface of the body of water about the housing to thereby establish a circulating flow defining said upper zone, said impeller further drawing a second volume of water up from the lower zone through said draft tube and into said upper zone, said second volume being a relatively small fraction
40 of the first volume.
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26. The system of claim 25 wherein said second volume is substantially between 1/100 and 1/5 of said first volume.

27. The system of claim 25 wherein said second volume is about 1/20 of said first volume.

28. The system of claim 25 wherein said second volume is about 1/40 of said first volume.

29. The system of claim 25 wherein said second volume is about 1/60 of said first volume

30. The system of claim 25 wherein the contents of said upper zone are aerobic.

31. The system of claim 30 wherein the contents of the lower zone are anaerobic.

32. The system of claim 25 wherein the contents of the lower zone are anaerobic.

33. The system of claim 25 wherein the housing for the impeller and the outlet portion of the draft tube extend about and outwardly of said vertical axis for respective distances and the distance the housing extends outwardly is greater than the distance the outlet portion extends outwardly of said vertical axis.

34. The system of claim 33 wherein the housing extends outwardly of said vertical axis about twice as far as said outlet portion.

35. The system of claim 34 wherein the opening through said plate member extend about and outwardly of the vertical axis.

36. The system of claim 34 wherein the opening through said plate member extend about and outwardly of the vertical axis for a distance substantially equal to the distance said outlet portion of said draft tube extends outwardly of said vertical axis.

37. The system of claim 25 wherein said outlet portion of said draft tube is substantially cylindrical.

38. The system of claim 25 further including a valve mechanism in said outlet portion of said draft tube to selectively adjust the fraction of the second volume to said first volume.

39. The system of claim 39 wherein said fraction is less than about 1/5.

40. The system of claim 25 further including a valve mechanism in said draft tube to selectively prevent and allow flow up through said draft tube.

41. The system of claim 25 wherein said plate member is substantially planar and extends substantially horizontally about and outward of the vertical axis.

42. The system of claim 25 wherein the housing for said impeller extends about and outwardly of said vertical axis for a distance less than said plate member extends outwardly of said vertical axis.

43. The system of claim 25 further including an arrangement to adjust the distance the plate member is spaced from said housing to selectively vary the size of the inlet opening therebetween.

44. The system of claim 25 further including an arrangement to adjust the distance the outlet portion of said draft tube extends above said plate member.

45. The system of claim 25 further including an arrangement to selectively adjust the size of the second volume of water being drawn up the draft tube.

5 46. The system of claim 45 further including a dissolved oxygen sensor positioned in said upper zone wherein said arrangement to selectively adjust the size of the second volume is automatically operated in response to readings from said sensor.

5 47. The system of claim 25 further including an inlet and outlet to said body of water, said outlet being positioned above the bottom and below the surface thereof wherein said circulating flow is said body of water is limited to said upper zone above the position of said outlet and the discharge through the outlet is substantially free of the contents of the upper zone.

5 48. A circulation system for a body of water, said system including a flotation platform, a dish supported adjacent the surface of said body of water, an impeller, a housing adjacent said impeller, a draft tube, and a draft tube supporting arrangement, said draft tube having a main body, an inlet portion, and an outlet portion, said draft tube depending downwardly from said supporting arrangement to position said inlet portion thereof at a depth below the surface of said body of water, said inlet portion to said main body having a plate member extending substantially horizontally outwardly of a vertical axis and being spaced from and below the main body of said draft tube, said plate member and said main body creating an inlet opening therebetween to said main body, said opening extending substantially about said vertical axis

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20 wherein said impeller draws water from the depth of said body of water substantially horizontally through said inlet opening above said plate member up the draft tube toward the surface of said body of water.

5 49. The system of claim 48 wherein said horizontal plate member is solid to limit the flow of water through said inlet opening between said plate member and said main body to being substantially horizontal.

5 10 50. The system of claim 49 wherein said plate member further includes an opening therethrough and said impeller draws a first volume of water substantially horizontally above said plate member through said inlet opening between said plate member and said main body into said main body and said impeller draws a second volume of water up through the opening in said plate member into said draft tube, said second volume being a relatively small fraction of the first volume.

51. The system of claim 50 wherein said second volume is substantially between about 2% and 10% of said first volume.

52. The system of claim 50 further including an arrangement to selectively adjust the size of the second volume of water being drawn up the draft tube.

53. The system of claim 52 further including a hydrogen sulfide sensor positioned adjacent said plate member wherein said arrangement to selectively adjust the size of the second volume is

5 automatically operated in response to readings from said sensor.

54. The system of claim 50 further including an arrangement to selectively prevent and allow flow up through the opening in said plate member

55. The system of claim 48 further including an arrangement contacting the bottom of the body of water and supporting said plate member at a predetermined distance above the bottom.

56. The system of claim 55 wherein said arrangement includes a plurality of leg members extending downward of said plate member.

57. The system of claim 56 wherein at least one of said leg members includes an arrangement to selectively adjust the distance the leg member extends downwardly of said plate member to vary the distance the leg member supports the plate member off the bottom.

58. The system of claim 48 wherein the draft tube is substantially vertically collapsible and said system further includes an arrangement to collect and contain the vertically collapsing draft tube adjacent the inlet portion thereof.

59. The system of claim 58 wherein said arrangement includes at least three arm members extending substantially vertically upward from adjacent the inlet portion of the draft tube and along the main body of the draft tube, said arm members being spaced about the main body of said draft tube to collect and contain the collapsing draft tube.

5 60. The system of claim 48 further including a dissolved oxygen sensor positioned in said upper zone wherein said arrangement to selectively adjust the size of the second volume is automatically operated in response to readings from said sensor.

5 61. A circulation system for a body of water having a surface and a bottom and further having an upper zone extending downwardly from the surface and a lower zone extending upwardly from the bottom toward the upper zone wherein a circulating flow is established and substantially limited to the upper zone leaving the lower zone substantially undisturbed and isolated from said circulating upper zone, said system including:

10 a flotation platform, a dish substantially supported adjacent the surface of the body of water, an impeller, a housing adjacent said impeller, and a plate member, said plate member being supported to extend substantially horizontally about and outwardly of a substantially vertical axis and being vertically spaced from and below said impeller and said housing, said plate member and said housing creating an inlet opening therebetween to said impeller, said inlet opening extending substantially about said vertical axis above said plate member wherein said impeller draws water substantially horizontally through said inlet opening above said plate member toward the surface of said body of water to establish a circulating flow defining said upper zone, said plate member extending substantially about and outwardly of said vertical axis to substantially limit the circulating flow to said upper zone leaving said lower zone substantially undisturbed and isolated from said circulating upper zone.

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62. The system of claim 61 wherein the contents of said upper zone are aerobic.

63. The system of claim 62 wherein the contents of the lower zone are anaerobic.

64. The system of claim 61 wherein the contents of the lower zone are anaerobic.

65. The system of claim 61 wherein the housing for said impeller extends about and outwardly of said vertical axis for a distance less than said plate member extends outwardly of said vertical axis.

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66. The system of claim 65 wherein the plate member extends outwardly of said vertical axis at least about twice the distance the housing extends outwardly of said vertical axis.

67. The system of claim 61 further including an arrangement to adjust the distance the plate member is spaced from said housing to selectively vary the size of the inlet opening therebetween.

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68. The system of claim 61 wherein the dish is spaced from the housing to create an annular opening therebetween extending substantially about the vertical axis and said impeller draws water through said housing wherein a first portion of the water drawn through said housing passes out of the annular opening and a second portion of the drawn water passes up through and out over the top of the dish.